

HRS QuickScore Scenario for the Smurfit-Stone Mill SI/RA
TDDs 1105-09 and 1109-07**Site Quick Score = 51.92**

URS Operating Services (UOS) collected source and release samples from the Smurfit-Stone Mill site during the week of October 23, 2011. An HRS scenario has been prepared for the site using this data:

Scenario: The site score is calculated using observational and chemical analysis data collected during the October 2011 SI/RA, as well as from background research conducted as part of the preliminary assessment for the site (e.g. information on the construction of the ponds). The 2011 analytical data shows observed contamination involving numerous analytes, particularly various dioxin/furan congeners and metals, is present within multiple source locations (sludge ponds 3, 4, 5 and 17; emergency spill pond 8; wastewater storage pond 2; and a soil pile near landfill A). None of these sources are fully contained (e.g. have no liners or run-on/run-off systems) (see Table 3 within the Final Analytical Results Report).

Analytical data also shows an observed release within surface water and sediment of the Clark Fork River, sediments within O'Keefe Creek, and within groundwater from the shallow aquifer as documented by the analysis of surface water, sediment, and groundwater samples.

Based on the analytical results from the 2012 SI, under the surface water pathway, the site scores greater than 28.5 on the human food chain threat and the environmental threat. The surface water and sediment release samples show actual contamination of O'Keefe Creek and the Clark Fork River, the later which is considered a fishery with a Montana Fish, Wildlife and Parks (MFWP) fishery resource value of 1 (Outstanding). Consumption of finfish, and likely crayfish, is probable, but not yet-proven.

The Clark Fork is also habitat for the federally-listed endangered bull trout. The release samples show actual contamination (Level II) of wetlands targets (a total of approximately 1.9 miles of frontage within the Clark Fork River) presuming that the palustrine emergent and palustrine scrub-shrub wetlands identified on the Montana Wetland Inventory Maps are HRS-eligible.

The groundwater release samples show actual contamination of the shallow aquifer. Samples of the deep aquifer (which is the aquifer used for drinking water in the vicinity of the site) were only

collected from domestic wells located some distance, and cross-gradient, from the source areas of the site and from a background location. Samples from the deep aquifer directly beneath the site (previously reported to be contaminated) were not collected. The ground water release samples collected from domestic wells did not appear to show evidence of contamination from the mill site. Discussion of site scoring results based on both potential release and assuming an observed release to the deep aquifer is included below.

Source Information

Analytical results from numerous source soil samples showed the presence of a number of hazardous substances at elevated concentrations (as defined by concentrations greater than 3 times background concentrations). Manganese was the most widespread metal, but other metals, including barium, cadmium, and zinc were also present in at least two source samples at elevated concentrations. A number of dioxin/furan congeners were also present at elevated concentrations in various sources. Two dioxin congeners (2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD), two furan congeners (2,3,7,8-Tetrachlorodibenzofuran (TCDF) and 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) were present in source samples at concentrations that exceed USEPA Superfund Chemical Data Matrix (SCDM) Cancer Risk Screening Concentration (CRSC) benchmark values for soil. Numerous other dioxin and furan congeners were also present at elevated concentrations in sources, but either do not have SCDMs benchmarks available or were below benchmark concentrations. The two congeners that were the most widespread in source samples (and sediment samples collected from the Clark Fork River) are 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD) and 2,3,4,7,8-PeCDF.

Arsenic was also present in a few source samples at concentrations that exceed the SCDM Reference Dose Screening Concentration (RDSC) for soil, although arsenic was also present in the background sample at a concentration that exceeded the SCDM CRSC. Concentrations of benzo(a)pyrene exceeded the SCDMs RDSC or CRSC benchmarks in one surface soil sample from the emergency spill pond.

For the purpose of scoring this site, sludge ponds 3, 4, 5 and 17 were all considered one source (source 1 – surface impoundment) as they were utilized by the site for similar purposes, have nearly identical containment characteristics, all contain similar contaminants, and are located adjacent to each other. Sludge pond 3 has been covered with a layer of saw dust, but this does not change its containment characteristics enough to warrant exclusion from this grouping (e.g. water is able to penetrate this covering material). Sludge ponds 3 and 17, and emergency spill pond 8 contain the highest

concentrations of manganese and dioxin/furan congeners, and sludge pond 17 is located adjacent to O'Keefe Creek. The combined sludge ponds source was assigned a hazardous waste stream quantity of 375,286 under Tier D (Area) (HRS Table 2-5), based on total pond surface areas as deduced from aerial photography.

Emergency spill pond 8 is considered a second source (source 2 – surface impoundment), as it was reportedly used by the mill for a different purpose than the sludge ponds and has a lesser number of dioxin and furan congeners present in elevated concentrations. Emergency spill pond 8 also has elevated concentrations of manganese. Containment characteristics for this pond are similar to those for the sludge ponds. Emergency spill pond 8 was assigned a hazardous waste stream quantity of 87,120 under Tier D (Area) (HRS Table 2-5), based on the ponds surface area as deduced from aerial photography.

Wastewater pond 2 is the final surface impoundment source scored for the site (source 3 – surface impoundment). This pond was largely used to store treated wastewater. Containment characteristics for pond 2 are similar to the other surface impoundments. Pond 2 had a similar number of dioxin congeners present in samples, but less furans, and manganese concentrations were not elevated in the samples collected. Wastewater pond 2 was assigned a hazardous waste stream quantity of 415,495 under Tier D (Area) (HRS Table 2-5), based on the ponds surface area as deduced from aerial photography.

The fourth and final source scored for the site is the three outfalls from the ponds (source 4 – other). All three outfalls will be considered one source for scoring purposes. These outfalls were all used to drain treated waste water from the ponds at the site into the Clark Fork River. Exact dates and durations that each outfall was used is unknown. The types of hazardous substances that were present in the outfall discharges are also unknown, but will be assumed to be similar to those found in shallow ground water beneath each pond. Source 4 was assigned a hazardous waste quantity of unknown but >0 under Tier C (Volume) (HRS Table 2-5).

Surface Water Pathway

Under the surface water pathway, both the Human Food Chain and Environmental threats were scored. The drinking water threat was not scored under this pathway because there are no known drinking water intakes within the 15-mile target distance limit (TDL).

Human Food Chain Threat

An observed release value of 550 was assigned as chemical analysis has shown that an observed release of numerous hazardous substances found in the sources has occurred. For waste characteristics, a value of 1,000 is assigned as there are various substances with high toxicity/persistence/bioaccumulation values available, and the assigned value for waste quantity is high (10,000) due to the size of the sources. The hazardous substance 2,3,4,7,8-PeCDF was used to calculate the waste characteristics value. A conservative value of 20 is assigned to the food chain individual target points value as the Clark Fork River fishery, anywhere within the TDL for the site, is subject to an observed release of numerous substances with a bioaccumulation potential factor of 500 or greater. Note that a higher value of 45 may be assigned for the human food chain individual value if the portion of the fishery directly adjacent to the site – where sediment and surface water samples were collected – could be shown to be a fishery. This value of 20 target points yields a human food chain threat score of 100 and an uncapped score of 133.33. Scoring the site on this threat alone results in a score of 50.

Environmental Threat

As with the Human Food Chain Threat, an observed release value of 550 was assigned as chemical analysis has shown that an observed release of numerous hazardous substances found in the sources has occurred. For waste characteristics, a value of 1,000 is assigned using the hazardous substance cadmium, which has an ecotoxicity/persistence/bioaccumulation value of 10,000. Target points for sensitive environments (e.g. wetlands) are driven by the 1.9 miles of wetlands frontage subject to Level II concentrations. These wetlands exist between sediment sampling locations SSSE05 and SSSE10, collected within the Clark Fork River which is adjacent to the west of the mill. A wetlands rating value of 50 (total length of wetlands of greater than 1 to 2 miles) is assigned (HRS Table 4-24). As this stretch of the Clark Fork River is habitat for the federally-listed endangered bull trout, a sensitive environments ratings value of 75 is assigned (HRS Table 4-23). This yields a Level II concentrations factor of 125. The potential contamination factor for the remainder of the TDL yields only a small additional point contribution of 0.02. This value of 125.02 target points yields an environmental threat score of 60

(maximum) and an uncapped score of 833.48. Scoring the site on this threat alone results in a score of 30. Scoring the site using both surface water threats results in a score of 50.

Groundwater Migration Pathway

There are two aquifers beneath the site: a shallow unconfined aquifer, and a deep drinking water aquifer. Under the groundwater migration pathway, only the deep aquifer was scored because there are no targets for the shallow groundwater aquifer.

As no analytes were found in the deep aquifer at elevated levels (noting that the deep aquifer was not sampled directly beneath the source area of the site, which has been reported to be contaminated), the deep aquifer was scored on potential to release. Discussion on the ground water pathway score if an observed release is assumed occurs at the end of this section.

For the potential to release, the hydraulic conductivity and thickness of the lowest hydraulic conductivity layer beneath the site were assumed to be 'less than 10^{-5} to 10^{-7} ', and 'greater than 5 to 100 feet' respectively. This is a best guess based on reporting of site condition by Hydrometrics, Inc. Coupled with other known information about the site (e.g. net precipitation data), the potential to release factor value is 210 (if an observed release could be shown, this number increases to 550).

For the ground water pathway, the metal manganese (with a toxicity/mobility value of 10,000) was available for scoring (HRS Table 4-12) (i.e. shown to be in an observed release to the shallow aquifer) and resulted in a waste characteristics value of 100 being assigned (HRS Table 2-6).

Target points totaled 110 points. Eighteen (18) points were assigned for the nearest well, which is assumed to be located approximately 0.33 miles due east of sludge pond 17, where a number of houses are located (this upgradient well location has not been confirmed, as only downgradient release wells were investigated during the SI). Eighty-seven (87) points were assigned for the population within 4 miles that uses groundwater for drinking water, and 5 points were assigned under the assumption that target wells within the deep aquifer are used for irrigation of commercial food crops or commercial forage crops.

Assuming the potential to release as noted above, the 110 target points allows for a site score of 28 for the groundwater migration pathway. However, if it is assumed that an observed release to the deep aquifer can be shown, and the observed release factor value is increased to 550, the site score increases to 73.34.

Conclusion

Using observational and chemical analysis data collected during the October 2011 SI/RA, data from background research conducted as part of the preliminary assessment for the site, the HRS scoring scenario described above for the human food chain threat results in a site score of 50. Scoring the site on the environmental threat alone (assuming that HRS-wetlands adjacent to the mill can be verified) results in a site score of 30. Under the current scenario, the ground water pathway will not score without showing an observed release to the deep aquifer, which supplies drinking water to area residents. The overall site score under the scenario described is 51.92.

The drivers for the site score are the large sources containing numerous hazardous substances (in particular metals and various dioxin/furan congeners) and the documented observed release to the Clark Fork River fishery (within the TDL) of hazardous substances with a bioaccumulation potential factor value of greater than 500. Greater confidence in the site score could be achieved if the area of the Clark Fork River adjacent to the mill (between sediment sampling locations) could be confirmed to a) be a fishery, and b) contain HRS-eligible wetlands. The ground water pathway could result in a higher site score (73.34) if a) an observed release to the deep, drinking water aquifer could be shown, and b) the nearest well to the site (believed to be 0.3 miles) could be confirmed.

5/30/13
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****PRE-DECISIONAL DOCUMENT****

**** SUMMARY SCORESHEET ****

**** FOR COMPUTING PROJECTED HRS SCORE ****

**** Do Not Cite or Quote ****

Site Name: Smurfit-Stone Mill

Region: Region 8

Scenario Name: Oct 2011 SI data

City, County, State: Missoula, Missoula
Co., Montana

Evaluator: Jeff Miller

EPA ID#: MTN000802850

Date: 08/21/2012

Lat/Long: 46:57:49,-114:12:0

Congressional District:

This Scoresheet is for: Integrated Assessment

Scenario Name: Oct 2011 SI data

Description:

	S pathway	S ² pathway
Ground Water Migration Pathway Score (S _{gw})	28.0	784.0
Surface Water Migration Pathway Score (S _{sw})	100.0	10000.0
Soil Exposure Pathway Score (S _s)	0.0	0.0
Air Migration Score (S _a)	0.0	0.0
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10784.0
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		2696.0
$/(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		51.92

Pathways not assigned a score (explain):

Soil exposure and air migration pathways are not scored due to lack of data.

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Aquifer Evaluated: deep aquifer - potential		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0.0
2. Potential to Release:		
2a. Containment	10	10.0
2b. Net Precipitation	10	3.0
2c. Depth to Aquifer	5	3.0
2d. Travel Time	35	15.0
2e. Potential to Release [(lines 2a(2b + 2c + 2d)]	500	210.0
3. Likelihood of Release (higher of lines 1 and 2e)	550	210.0
Waste Characteristics:		
4. Toxicity/Mobility	(a)	10000.0
5. Hazardous Waste Quantity	(a)	10000.0
6. Waste Characteristics	100	100.0
Targets:		
7. Nearest Well	(b)	18.0
8. Population:		
8a. Level I Concentrations	(b)	0.0
8b. Level II Concentrations	(b)	0.0
8c. Potential Contamination	(b)	87.0
8d. Population (lines 8a + 8b + 8c)	(b)	87.0
9. Resources	5	5.0
10. Wellhead Protection Area	20	0.0
11. Targets (lines 7 + 8d + 9 + 10)	(b)	110.0
Ground Water Migration Score for an Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500] ^c	100	28.0
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	0.0

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Watershed Evaluated: Okeefe Creek and Clark Fork River		
Drinking Water Threat		
Likelihood of Release:		
1. Observed Release	550	550.0
2. Potential to Release by Overland Flow:		
2a. Containment	10	10.0
2b. Runoff	10	0.0
2c. Distance to Surface Water	5	20.0
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35	200.0
3. Potential to Release by Flood:		
3a. Containment (Flood)	10	10.0
3b. Flood Frequency	50	25.0
3c. Potential to Release by Flood (lines 3a x 3b)	500	250.0
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	450.0
5. Likelihood of Release (higher of lines 1 and 4)	550	550.0
Waste Characteristics:		
6. Toxicity/Persistence	(a)	0.0
7. Hazardous Waste Quantity	(a)	10000.0
8. Waste Characteristics	100	0.0
Targets:		
9. Nearest Intake	50	0.0
10. Population:		
10a. Level I Concentrations	(b)	0.0
10b. Level II Concentrations	(b)	0.0
10c. Potential Contamination	(b)	0.0
10d. Population (lines 10a + 10b + 10c)	(b)	0.0
11. Resources	5	0.0
12. Targets (lines 9 + 10d + 11)	(b)	0.0
Drinking Water Threat Score:		
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100	0.0
Human Food Chain Threat		
Likelihood of Release:		
14. Likelihood of Release (same value as line 5)	550	550.0
Waste Characteristics:		
15. Toxicity/Persistence/Bioaccumulation	(a)	5.0E8
16. Hazardous Waste Quantity	(a)	10000.0
17. Waste Characteristics	1000	1000.0
Targets:		
18. Food Chain Individual	50	20.0
19. Population		
19a. Level I Concentration	(b)	0.0
19b. Level II Concentration	(b)	0.0
19c. Potential Human Food Chain Contamination	(b)	0.0
19d. Population (lines 19a + 19b + 19c)	(b)	0.0
20. Targets (lines 18 + 19d)	(b)	20.0
Human Food Chain Threat Score:		
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100	100.0
Environmental Threat		
Likelihood of Release:		
22. Likelihood of Release (same value as line 5)	550	550.0
Waste Characteristics:		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	5.0E8
24. Hazardous Waste Quantity	(a)	10000.0
25. Waste Characteristics	1000	1000.0

• **Targets:**

26. Sensitive Environments		
26a. Level I Concentrations	(b)	0.0
26b. Level II Concentrations	(b)	125.0
26c. Potential Contamination	(b)	0.02
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	125.02
27. Targets (value from line 26d)	(b)	125.02
Environmental Threat Score:		
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60	60.0
Surface Water Overland/Flood Migration Component Score for a Watershed		
29. Watershed Score ^c (lines 13+21+28, subject to a max of 100)	100	100.00
Surface Water Overland/Flood Migration Component Score		
30. Component Score (S _{sw}) ^c (highest score from line 29 for all watersheds evaluated)	100	100.00

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Watershed Evaluated: Okeefe Creek and Clark Fork River		
Drinking Water Threat		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0.0
2. Potential to Release:		
2a. Containment	10	0.0
2b. Net Precipitation	10	0.0
2c. Depth to Aquifer	5	0.0
2d. Travel Time	35	0.0
2e. Potential to Release [(lines 2a(2b + 2c + 2d)]	500	0.0
3. Likelihood of Release (higher of lines 1 and 2e)	550	0.0
Waste Characteristics:		
4. Toxicity/Mobility	(a)	0.0
5. Hazardous Waste Quantity	(a)	10000.0
6. Waste Characteristics	100	0.0
Targets:		
7. Nearest Well	(b)	0.0
8. Population:		
8a. Level I Concentrations	(b)	0.0
8b. Level II Concentrations	(b)	0.0
8c. Potential Contamination	(b)	0.0
8d. Population (lines 8a + 8b + 8c)	(b)	0.0
9. Resources	5	0.0
10. Targets (lines 7 + 8d + 9)	(b)	0.0
Drinking Water Threat Score:		
11. Drinking Water Threat Score [(lines 3 x 6 x 10)/82,500, subject to max of 100]	100	0.0
Human Food Chain Threat		
Likelihood of Release:		
12. Likelihood of Release (same value as line 3)	550	0.0
Waste Characteristics:		
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	0.0
14. Hazardous Waste Quantity	(a)	10000.0
15. Waste Characteristics	1000	0.0
Targets:		
16. Food Chain Individual	50	0.0
17. Population		
17a. Level I Concentration	(b)	0.0
17b. Level II Concentration	(b)	0.0
17c. Potential Human Food Chain Contamination	(b)	0.0
17d. Population (lines 17a + 17b + 17c)	(b)	0.0
18. Targets (lines 16 + 17d)	(b)	0.0
Human Food Chain Threat Score:		
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,subject to max of 100]	100	0.0
Environmental Threat		
Likelihood of Release:		
20. Likelihood of Release (same value as line 3)	550	0.0
Waste Characteristics:		
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	0.0
22. Hazardous Waste Quantity	(a)	10000.0
23. Waste Characteristics	1000	0.0
Targets:		
24. Sensitive Environments		
24a. Level I Concentrations	(b)	0.0
24b. Level II Concentrations	(b)	0.0

24c. Potential Contamination	(b)	0.0	
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	0.0	
25. Targets (value from line 24d)	(b)		0.0
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		0.0
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score ^c (lines 11 + 19 + 28, subject to a max of 100)	100		0.0
28. Component Score (S _{gs}) ^c (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		0.0

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Exposure:		
1. Likelihood of Exposure	550	
Waste Characteristics:		
2. Toxicity	(a)	0.0
3. Hazardous Waste Quantity	(a)	
4. Waste Characteristics	100	0.0
Targets:		
5. Resident Individual	50	
6. Resident Population:		
6a. Level I Concentrations	(b)	0
6b. Level II Concentrations	(b)	
6c. Population (lines 6a + 6b)	(b)	
7. Workers	15	0.0
8. Resources	5	
9. Terrestrial Sensitive Environments	(c)	
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)	0.0
Resident Population Threat Score		
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)	0.0
Nearby Population Threat		
Likelihood of Exposure:		
12. Attractiveness/Accessibility	100	0.0
13. Area of Contamination	100	5.0
14. Likelihood of Exposure	500	0.0
Waste Characteristics:		
15. Toxicity	(a)	0.0
16. Hazardous Waste Quantity	(a)	0.0
17. Waste Characteristics	100	0.0
Targets:		
18. Nearby Individual	1	0.0
19. Population Within 1 Mile	(b)	
20. Targets (lines 18 + 19)	(b)	
Nearby Population Threat Score		
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)	0.0
Soil Exposure Pathway Score:		
22. Pathway Score ^d (S _s), [(lines (11+21)/82,500, subject to max of 100]	100	0.0

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60

^d Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Release:		
1. Observed Release	550	
2. Potential to Release:		
2a. Gas Potential to Release	500	
2b. Particulate Potential to Release	500	
2c. Potential to Release (higher of lines 2a and 2b)	500	
3. Likelihood of Release (higher of lines 1 and 2c)	550	
Waste Characteristics:		
4. Toxicity/Mobility	(a)	
5. Hazardous Waste Quantity	(a)	
6. Waste Characteristics	100	
Targets:		
7. Nearest Individual	50	
8. Population:		
8a. Level I Concentrations	(b)	
8b. Level II Concentrations	(b)	
8c. Potential Contamination	(c)	
8d. Population (lines 8a + 8b + 8c)	(b)	
9. Resources	5	
10. Sensitive Environments:		
10a. Actual Contamination	(c)	
10b. Potential Contamination	(c)	
10c. Sensitive Environments (lines 10a + 10b)	(c)	
11. Targets (lines 7 + 8d + 9 + 10c)	(b)	
Air Migration Pathway Score:		
12. Pathway Score (S_a) $[(\text{lines } 3 \times 6 \times 11)/82,500]^d$	100	

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.

^d Do not round to nearest integer